

# OHIO RIVER BASIN PRECIPITATION FREQUENCY PROJECT

Update of *Technical Paper No. 40, NWS HYDRO-35* and *Technical Paper No. 49*

Twenty-second Progress Report  
1 January 2005 through 31 March 2005

Office of Hydrologic Development  
U.S. National Weather Service  
National Oceanic and Atmospheric Administration  
Silver Spring, Maryland

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## DISCLAIMER

The data and information presented in this report are provided only to demonstrate current progress on the various technical tasks associated with this project. Values presented herein are NOT intended for any other use beyond the scope of this progress report. Anyone using any data or information presented in this report for any purpose other than for what it was intended does so at their own risk.

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## OHIO RIVER BASIN PRECIPITATION FREQUENCY PROJECT

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### 1. Introduction

The Hydrometeorological Design Studies Center (HDSC), Hydrology Laboratory, Office of Hydrologic Development, NOAA National Weather Service has updated its precipitation frequency estimates for the Ohio River Basin and surrounding states. Previous precipitation frequency estimates for this area were contained in *Technical Paper No. 40* "Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years" (Hershfield, 1961), NWS HYDRO-35 "Five- to 60-minute precipitation frequency for the eastern and central United States" (Frederick et al., 1977) and *Technical Paper No. 49* "Two- to ten-day precipitation for return periods of 2 to 100 years in the contiguous United States" (Miller et al., 1964). The new project included collecting data and performing quality control, compiling and formatting datasets for analyses, selecting applicable frequency distributions and fitting techniques, analyzing data, mapping and preparing reports and other documentation.

The project determined annual all-season precipitation frequencies for durations from 5 minutes to 60 days, for average recurrence intervals from 2 to 1,000 years. The project reviewed and processed all appropriate rainfall data for the project area and used accepted statistical methods. The project results are published as Volume 2 of NOAA Atlas 14 on the internet (<http://www.nws.noaa.gov/ohd/hdsc>) with the additional ability to download digital files.

The project produced estimates for 13 states. Parts of nine additional bordering states were included in the original analysis to ensure continuity across state borders. The core and border areas and regional groups used for long duration (24-hour through 60-day) analyses are shown in Figure 1. Regional groups used for short duration (60-minute through 12-hour) analyses are shown in Figure 2.

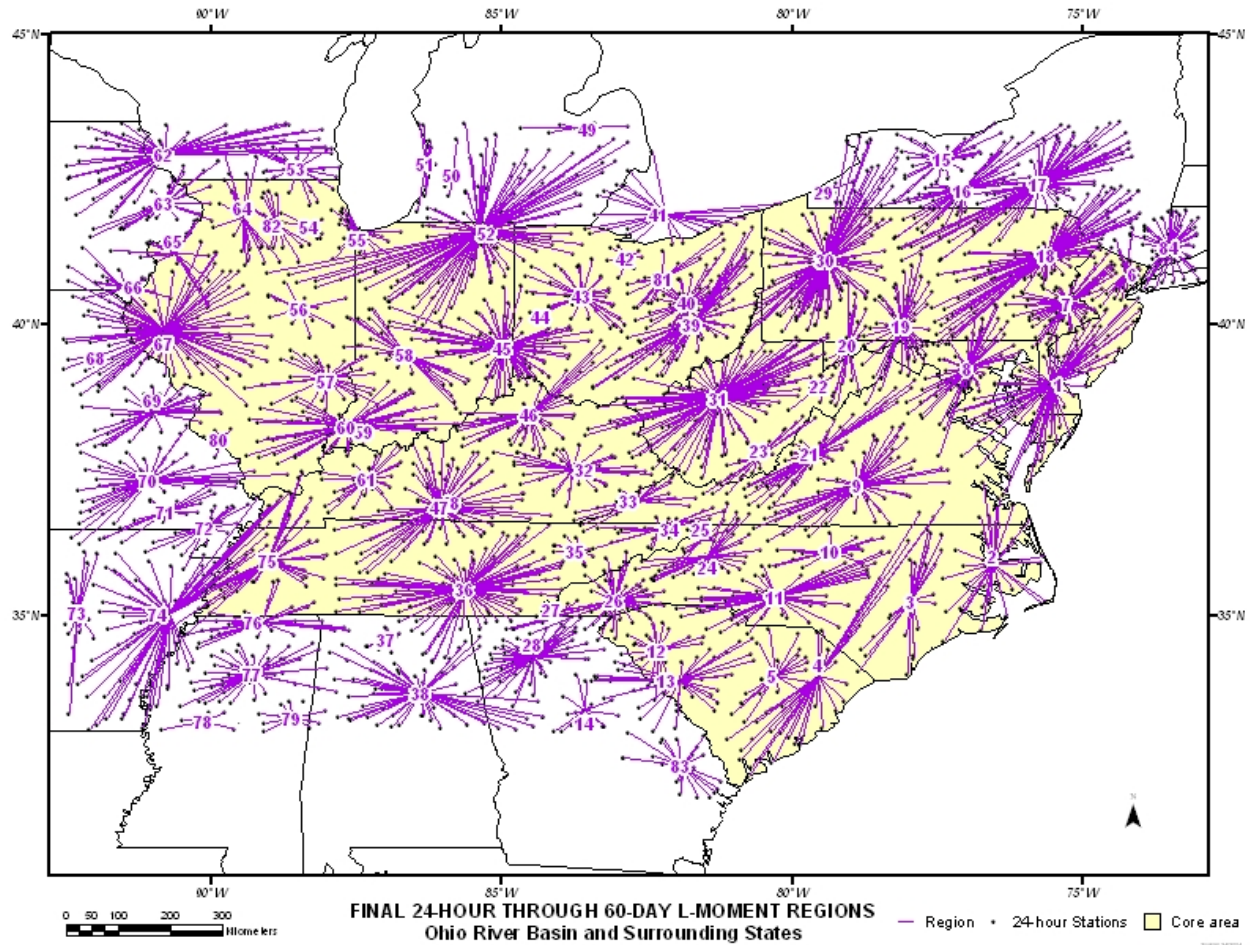


Figure 1. Ohio River Basin project area and 84 daily regional groups.

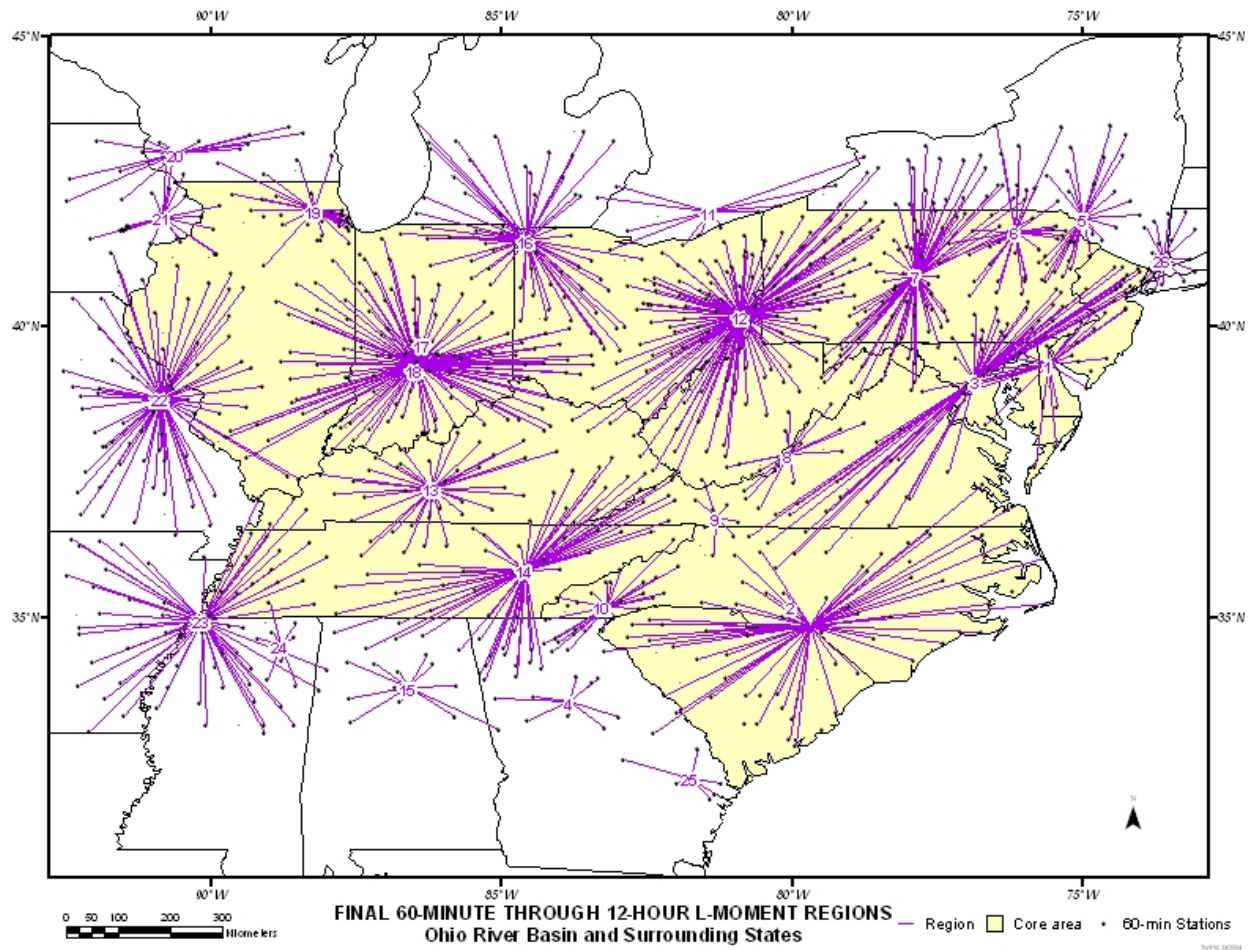


Figure 2. Ohio River Basin project area and 26 hourly regional groups.

## 2. Highlights

Hydrometeorological Design Studies Center (HDSC) released draft documentation for NOAA Atlas 14 Volume 2 on February 17, 2005, at which point a one month peer review commenced. The documentation page was made available at [http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_docs.html](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_docs.html). Comments will be addressed and the final documentation released during the next quarter. Additional information is provided in Section 3.1, Final Documentation.

The Precipitation Frequency Data Server (PFDS), the on-line portal for all NOAA Atlas 14 deliverables and information, underwent several important changes. The most noticeable change was the re-organization of the GIS Download page. Additional information is provided in Section 3.2, PFDS.

Progress on the development of areal reduction factors remains slow due to difficulties in completing the analysis software. Development and testing of software from the procedure described in NOAA Technical Report NWS 24 is 95% completed. Modifications have also been made in the ARF sites with respect to which stations are being used. Two statistical procedures have been prepared to test the differences between the ARF curves generated from the various sites. Additional information is provided in Section 3.3, Areal Reduction Factors.

### 3. Progress in this Reporting Period

#### 3.1 Final Documentation

Hydrometeorological Design Studies Center (HDSC) released draft documentation for NOAA Atlas 14 Volume 2 on February 17, 2005, at which point a one month peer review commenced. The NOAA Atlas 14 documentation page ([http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_docs.html](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_docs.html)) served as the on-line portal for the documentation peer review. Since the documentation for Volume 2 is similar to the Volume 1 documentation, which has already been peer reviewed and published, HDSC did not receive or expect many comments. Reviewers were asked to focus comments on the substance of the text, but comments addressing other aspects were appreciated. HDSC requested comments from nearly 250 individuals/groups.

The review ended on March 17, 2005 and ten individuals/groups submitted comprehensive reviews. A distilled list of all of the comments was created to expedite the processing and assembly of an all-inclusive response. In all, nearly 90 unique comments/suggestions, most of which encouraged further clarification of specific items, were received. The all-inclusive list of comments and responses and the final documentation will be made available on the web page during the next quarter.

#### 3.2 Precipitation Frequency Data Server

The Precipitation Frequency Data Server (PFDS), the on-line portal for all NOAA Atlas 14 deliverables and information, under went several important changes. The most noticeable change was the re-organization of the GIS Download page. To ease confusion and increase usability, this page, which was originally multiple pages long, was split into four separate web pages titled: Time Series, Maps, GIS Data and Version Numbers. As a result, the left sidebar items changed accordingly. Furthermore, buttons to these pages were added to the header of the state specific pages to allow easier navigation.

Other changes include:

1. Continued to update the PFDS Performance and Stats page on a monthly basis (see below).
2. Added a link to Customer Survey results so users could view the categorical feedback we're getting.
3. A few frequently asked questions (FAQ) were added to the FAQ page.

HDSC continuously monitors the hits, integrity and performance of the PFDS, which continues to receive an increasing number of hits per month. The graph (Figure 3) below summarizes the number of individual data inquires made since January 2004, while the map (Figure 4) indicates the locations of inquires during the past quarter.



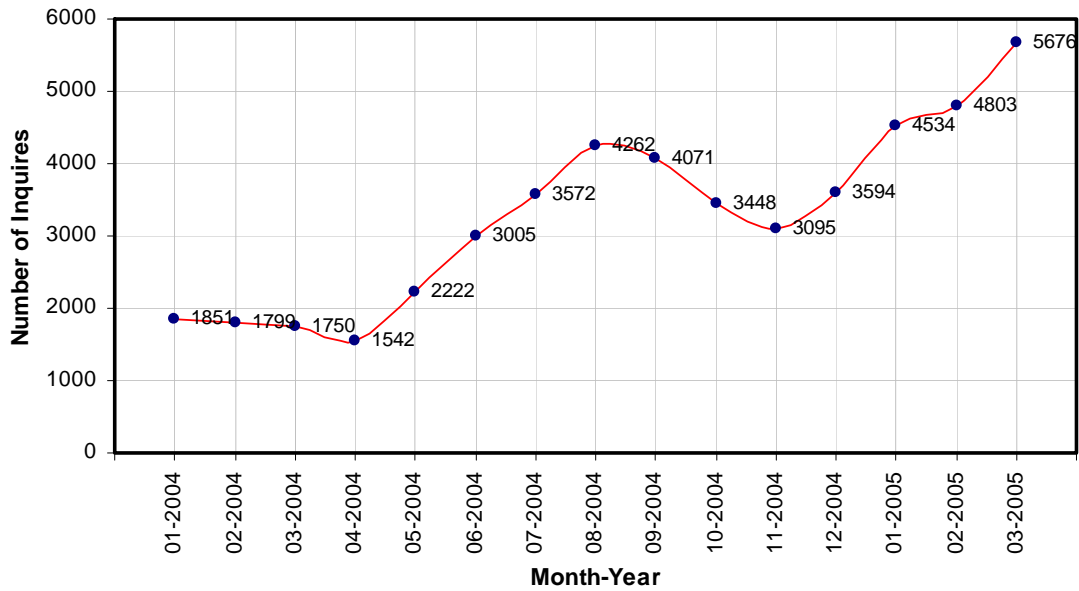


Figure 3: Number of individual PFDS data inquiries per month.

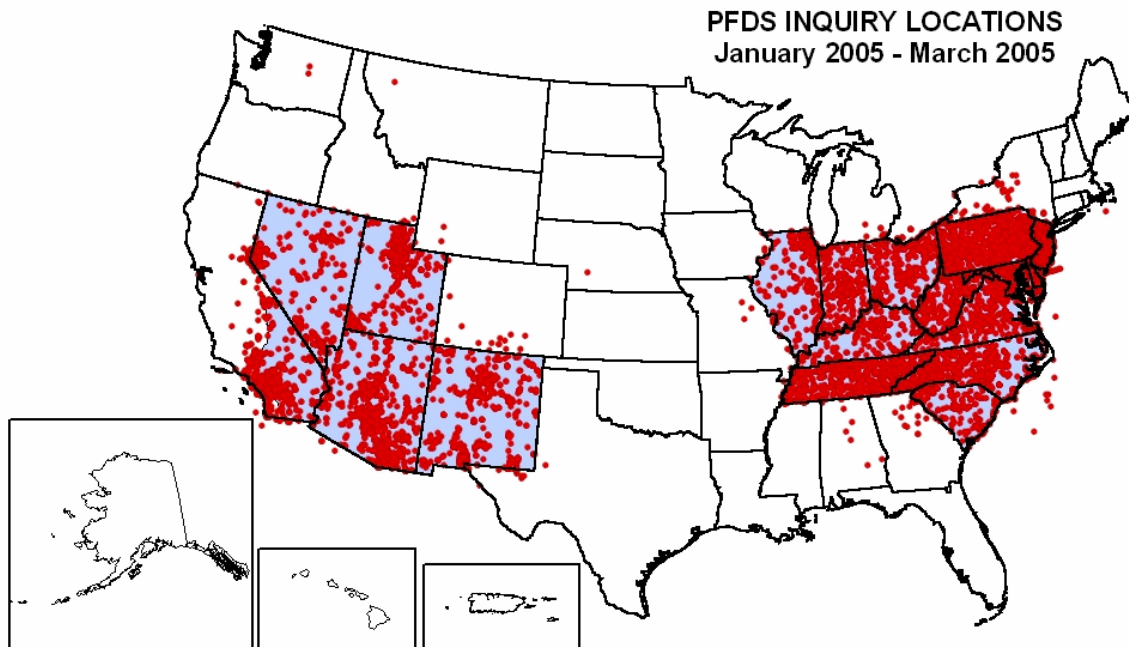


Figure 4: Map of 15,013 PFDS data inquiry locations during the period January-March 2005.

### 3.3 Areal Reduction Factors

Work continues in the development of geographically-fixed Areal Reduction Factor (ARF) curves for basin area sizes of 10 to 400 square miles. Progress has been slow due to difficulties in completing the analysis software. Development and testing of software from the procedure described in NOAA Technical Report NWS 24 is 90% completed. Modifications have been made in the ARF sites with respect to which stations are being used. This is being done to ensure distances between stations used in the calculations are appropriate. In particular, if a station is more than 80 miles away from any other station for that study site, then that station will not be used in that site's ARF analysis.

Two statistical and objective testing procedures, the sign test (Himmelblau, 1970) and a modified "student t" test (Siegel, 1961) will be used in testing the differences in the ARF curves generated from the various sites. A third objective statistical test for testing differences in the ARF curves is currently being investigated. These procedures were also used in an ARF study performed by Bell (1976).

## **4. Issues**

### **4.1 Recent and Upcoming Presentations**

On March 30 and 31, Geoff Bonnin traveled to Puerto Rico to discuss progress on updating precipitation frequency estimates for Puerto Rico and the U.S. Virgin Islands. In a series of meetings, he met with the NOAA's San Juan Weather Forecast Office (WFO), Puerto Rico and the Commonwealth of Puerto Rico's Department of Natural Resources and Minerals in San Juan. Other interested parties attended such as U.S. Geological Survey, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency and the U.S. Department of Agriculture.

HDSC has submitted a poster paper entitled "NOAA Atlas 14, the new precipitation frequency atlas for the United States" for the European Geosciences Union General Assembly meeting on April 24 – 29, 2005 in Vienna, Austria. Due to funding and schedule considerations, the poster will be presented by others from the Office of Hydrologic Development already attending the meeting.

### **4.2 1-year Precipitation Frequency**

HDSC has been approached by the State of Maryland State Highway Administration (MDSHA) to calculate and include the 1-year average recurrence interval (ARI) precipitation frequency estimates for NOAA Atlas 14 Volume 2. Discussions are being held with MDSHA on funding and contractual mechanisms and the areas to be covered.

## **5. Projected Schedule and Remaining Tasks**

The following list provides a tentative schedule with completion dates. Brief descriptions of tasks being worked on next quarter are also included in this section.

Final Documentation [May 2005]  
Spatial Relations (Areal Reduction Factors) [May 2005]

### **5.1 Final Documentation**

Final documentation will be published during the next quarter.

### **5.2 Areal Reduction Factors (ARF)**

Computations for the ARF curves will be completed for 14 areas. The resulting curves will be tested for differences to determine if a single set of ARF curves is applicable to the entire U.S. or whether curves vary by region.

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